Name_____   Period _____
Algebra 2   Circle: AC   or   BD

Long-term Assignment #4   *Due*_____
21 total points

1) The Washington Nationals baseball team was purchased in 2006 for 450 million dollars. If the value of this investment grows at a rate of 5% compounded yearly, the purchase price of the team in year 2006 + t will be given by $V(t) = 450(10^{0.02\,1t})$.

   a. Explain how you can be sure that this function gives the correct value of the investment in 2006. (2 points)

   b. Use the function to estimate the value of the investment in 2015. (1 points)

   c. Use logarithms and other algebraic reasoning to estimate the time when the value of the investment will be $1 billion ($1,000 million) Show work. (2 points)

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2) The magnitude of an earthquake is often reported using the Richter scale. This rating depends on the amount of displacement recorded by a seismogram and the distance from the epicenter of the earthquake to the device. The table below gives the Richter scale ratings from measurements at a distance of 100 km from the epicenter of an earthquake.

Seismogram Displacement (in meters)	10^{-6}	10^{-5}	10^{-4}	10^{-3}	10^{-2}	10^{-1}	10^{0}	10^{1}	10^{2}
Richter Scale Rating	1	2	3	4	5	6	7	8	9

a. Write a function R(x) which gives the Richter scale rating for an earthquake based upon the displacement x in meters of a seismograph located 100 km from the epicenter of an earthquake. (2 points)

b. A scientist noticed a displacement of 0.054 meters on a seismogram located 100 km from the epicenter of an earthquake.

   i. Between what two whole numbers did the Richter scale rating of this quake fall and how do you know from inspecting the table of sample Richter scale values? (1 points)

   ii. What was the precise Richter scale rating of the earthquake? (1 points)

c. The earthquake that caused the Indian Ocean Tsunami in December of 2004 reportedly measured 9.15 on the Richter scale. What displacement would be recorded on the seismograph on Simeulue Island, approximately 100 km away from the epicenter? (2 points)

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3) Explain what is meant by the equation log a = b. Then use your explanation to show why the following statements are true. (4 points)

    a. $\log 1 = 0$

    b. $\log 10 = 1$

    c. $\log 10^{x} = x$

4) Suppose that n is a positive integer. (6 points)

    a.   If $0 < \log n < 1$, what can you say about the possible values of n?

    b.   If $5 < \log n < 6$, what can you say about the possible values of n?

    c.   If $p < \log n < p+1$, where p is a positive integer, what can you say about the possible values of n?